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THE FY05-FY08 PERFORMANCE AUDIT OF HOUSTON METRO MEETS STATE REQUIREMENTS AND PROVIDES A BALANCED AND OBJECTIVE ASSESSMENT OF METRO'S PERFORMANCE

• Section 451.454 of the Texas Transportation Code mandates quadrennial performance audits of transit agencies. The purpose of the performance audit is to provide:
  – Information necessary for state and local officers to perform oversight functions
  – Information useful to improve METRO’s operations efficiency and effectiveness.

• This performance audit is required to review METRO's performance over four years from FY05 through FY08 (October 2004-September 2008), by assessing METRO’s:
  – Data collection and measurement of specified key performance indicators
  – Compliance with applicable state laws
  – Performance in one of three areas (i.e., administration and management, transit operations, or system maintenance).

• State performance audit requirements stipulate that performance in each functional area must be addressed once every three audits. This audit includes a review of METRO’s fixed route bus and rail maintenance functions.
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THE PERFORMANCE AUDIT PROVIDES AN OBJECTIVE ASSESSMENT OF METRO'S MAINTENANCE PERFORMANCE

- While the audit complies with State requirements, a review of METRO’s maintenance performance alone cannot provide a meaningful understanding of the Authority’s transit performance trends. A full understanding of METRO’s transit performance would require reviewing METRO’s transportation program as well as its administrative activities and management performance during the audit period.

- The audit is a look back over the past four years. Since current trends and programs are more relevant as METRO moves forward, an effort has been made to recognize plans and activities that are currently underway and to articulate their relevance for METRO’s future.
METRO PROVIDES BUS, LIGHT RAIL, AND DEMAND RESPONSE SERVICE IN THE HOUSTON METROPOLITAN AREA

- METRO’s fixed route bus services operate over a 1,285 square mile service area that includes the City of Houston, 14 other municipalities, portions of unincorporated Harris County, and small portions of surrounding counties.

- METRO’s fixed route bus services carry over 84 million passenger trips annually throughout greater Houston with a 1,210-vehicle fleet:
  - METRO has over 100 local and commuter bus routes, 19 transit centers, and 28 park-and-ride lots. During the audit period, METRO also ran special event services in partnership with event sponsors, such as conventions and sporting events.
  - Bus services are partially directly operated and partially operated under contract. METRO has five operating facilities for its directly operated services (Fallbrook, Polk, West, Hiram Clarke, and Kashmere). Contracted services operate from METRO’s Northwest bus operating facility.

- METRORail, METRO’s light rail service, began operations in January 2004 and now carries nearly 12 million passenger trips annually with an 18-vehicle fleet. The METRORail line runs 7.5 miles and serves 16 stations, linking Downtown, Midtown, the Museum District, Hermann Park, the Texas Medical Center (TMC), and Reliant Park.

- METROLift, METRO’s demand response service, provides pre-scheduled, curb-to-curb shared-ride transportation for persons with disabilities. METROLift serves about 1.4 million passenger trips annually.
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METRO IS IN COMPLIANCE WITH ESSENTIALLY ALL OF 123 GOVERNMENT CODE REQUIREMENTS

• The compliance review assesses compliance with approximately 123 legislative requirements in seven areas.

• METRO is in full or substantial compliance with all but four requirements:
  – Certified Board meeting agendas must be signed by the presiding Board member to indicate they are true and correct representations of the items discussed. Two of the 15 certified Board meeting agendas that were reviewed were not signed.
  – METRO must respond to information requests within ten days after the request or by an extended due date. METRO provided the information later than ten days after the request or extended due date in two of 38 instances reviewed.
  – Although annual financial audit reports were completed in a timely matter, METRO promptly distributed them to some but not all of the required parties.
  – METRO was required to provide copies of the FY01-FY04 performance audit reports to specified parties by February 1, 2005. METRO sent the copies in July 2005.
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STATE-MANDATED KEY PERFORMANCE INDICATORS ILLUSTRATE METRO’S POSITIVE PERFORMANCE TRENDS FOR THE AUDIT PERIOD

• METRO is in compliance with requirements for data and performance indicator reporting. The base data used to develop state-mandated performance indicators conform to State definitions and METRO complies with all data collection and verification requirements.

• Performance trends experienced during the previous (i.e., FY01-FY04) audit period were reversed during the current audit period. For example, concerted efforts to improve ridership were successful. While ridership declined over 5% during the previous period, it increased over 3% during the past four years.

• Cost effectiveness/efficiency measures illustrate the results of steps METRO took to contain costs and increase ridership:
  – Operating cost per passenger increased less than 3%, far less than the 12.6% increase in the CPI for the Houston-Galveston-Brazoria area over the same period. During the prior audit period, this indicator increased 36%, while the CPI grew 10%.
  – Cost effectiveness measures (operating cost per revenue hour and per revenue mile) increased 14% and 13.6%, respectively – only slightly higher than the growth in the CPI – at a time when METRO, like transit agencies across the county, was coping with rapid growth in the costs of health and pension benefits and fuel. For FY01-FY04, when the CPI increased 10%, cost per hour increased 19% and cost per mile increased 17%.
PERFORMANCE TRENDS IN STATE-MANDATED REVENUE INDICATORS ALSO IMPROVED

- The fare recovery rate improved nearly 8%, from 15.3% to 16.5%, when METRO introduced the METRO Q® stored value fare card and eliminated prepaid fare products. During the prior audit period, farebox recovery dropped 29%.

- Sales and use tax receipts per passenger increased 34.4%, compared to 12% from FY01 through FY04.
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TWO SERVICE QUALITY MEASURES REMAINED CONSTANT OR IMPROVED

• Average vehicle occupancy, a measure of vehicle utilization and productivity that is measured by dividing total passenger miles by total revenue vehicle miles, remained relatively flat as METRO took steps to improve service effectiveness. During the prior audit period, vehicle occupancy fell 10%.

• Miles between mechanical road calls improved as METRO replaced older buses and improved road call training. For FY01-FY04, this indicator declined 22%.
TWO SERVICE QUALITY INDICATORS DECLINED

- On-time performance declined 28.8% as a consequence of METRO’s transition from manual point checks to electronic data from the Integrated Vehicle Operations Management System (IVOMS). As METRO staff evaluate the volume and the anomalies of electronic data and the implications of using them to report on-time performance, it is also important to recognize METRO’s efforts to improve on-time performance and service delivery by using those data to identify and analyze low performing routes and make adjustments to schedules and routes. On-time performance declined 3% from FY01 through FY04.

- METRO’s accident rate fluctuated over the audit period, but increased from under 4.0 accidents per 100,000 total miles in FY04 and FY05 to over 4.5 in FY07 and FY08. Safety is a major priority for METRO. Accidents and accident trends are monitored closely and appropriate training is provided. METRO also took steps to improve safety, such as improving signaling and installing in-pavement lighting at rail grade crossings. During the previous audit period, the accident rate improved 7%.
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METRO MANAGEMENT HAS IMPLEMENTED A VARIETY OF INITIATIVES TO IMPROVE OVERSIGHT AND TARGET COST REDUCTIONS

• Management has proactively controlled costs by eliminating unproductive bus routes and restructuring service to generate cost savings and improve the fare recovery ratio, while absorbing large increases in key transit service costs (e.g., fuel, healthcare, pensions). Today, METRO operates approximately 30 fewer route segments than it did in FY04. Actions such as these will provide on-going savings for the future and continue to improve ridership.

• Throughout this time, to ensure that cost savings are realized, METRO has placed attention on developing, implementing, and reporting systemwide and departmental goals and objectives, and on holding managers and supervisors responsible for developing their budgets and for performance against and variances from budgeted goals and objectives. Along with managing their costs, superintendents have the authority to make choices, and have the data to evaluate options such as whether to purchase new or refurbish parts.

• Quality Assurance and Technical Services reviews equivalent parts sources based on consumption and proposes alternatives. Alternate vendors are reviewed annually to compare component costs and failure rates of internal METRO overhauls to external vendor sourcing.

• Each budget has provided more and better information about METRO’s performance targets. Quarterly Management Reports have been developed to track performance and report it to the Board of Directors, while internal dashboard reports and weekly cost variance reports provide information to managers to assist them in managing their responsibilities.
METRO IS REDUCING THE SIZE OF THE REVENUE AND NON-REVENUE FLEETS

- The size of the active bus fleet has been reduced from 1,435 buses in FY04 to 1,232 buses in FY05, and further to 1,210 buses in FY08. In FY2007, METRO began procuring hybrid-diesel electric buses that have lower fuel consumption and substantially lower tailpipe emissions. Going forward, METRO intends to replace about 100 buses per year, to avoid the challenges of managing large one-time procurements and to smooth the age distribution of the fleet.

- METRORail has operated with a fleet of 18 light rail vehicles since service was initiated in January 2004. Typically, 16 of the LRVs are in service at any time. The small size of the fleet appears to constrain METRO’s ability to increase service and grow ridership.

- The size of the non-revenue fleet was reduced from 435 to 371 vehicles over the audit period. An FY09 mandate will reduce the fleet further, to 348 vehicles. As vehicles are replaced, METRO is investigating the cost-effectiveness of hybrid technology in non-revenue vehicles and is pursuing smaller, more fuel-efficient vehicles for the non-revenue fleet.
MILES BETWEEN ROAD CALLS, A KEY PERFORMANCE INDICATOR FOR MAINTENANCE, IMPROVED DURING THE AUDIT PERIOD

- Miles between mechanical road calls for directly operated bus and rail services dropped 25% from 6,206 to 4,563 in FY05, but since then have improved annually, reaching 6,362 miles in FY08. Reduced service levels, replacement of older buses, and increased road call training, including the use of the Road Call Reduction Manual to help operators troubleshoot bus problems, have contributed to the reduction in bus mechanical road calls and the increase in miles between mechanical road calls.

- For directly operated bus services, the number of mechanical road calls increased from 7,264 in FY04 to 8,350 in FY05, but then dropped to 5,793 in FY08. Overall, the number of bus road calls fell 20.3% during the audit period, while total bus vehicle miles dropped 17.7%, resulting in a 3.2% improvement in miles between bus mechanical road calls.

- For FY04, when METRORail operated nine months of service, miles between roadcalls were reported to be 39,900. Beginning with FY05, the first full year of service, METRORail had 210 mechanical roadcalls and operated 855,000 vehicle miles, resulting in 4,072 miles between rail roadcalls. In FY08, this indicator increased to 6,935 miles between roadcalls, improving 70% over FY05.
AUDIT PERIOD ACCOMPLISHMENTS INCLUDE ACTIONS TO CONTROL MAINTENANCE COST GROWTH

- METRO eliminated MEAD, the Maintenance Education Apprentice Development program and the journeyman program, and is implementing an ASE certification program. The training program also builds on METRO’s practice of relying on vendors to provide training on new equipment, particularly buses. METRO also relies on vendors to provide the special tools required while equipment is still under warranty, permitting METRO to defer the purchase of those tools until warranties expire.

- METRO developed a part-time bus mechanic program that permits the Authority to hire retired METRO mechanics, giving METRO the ability to capitalize on the knowledge and skills of the most experienced mechanics.

- A Maintenance Training Specialist, who previously worked for Siemens, was hired to run METRORail's maintenance training program. He has enhanced the documentation, instituted a training program for all four maintenance disciplines, and initiated the “METRO Learning Center” using computer-based training. Employees now participate in a “Learning Management System,” in which their maintenance competency is regularly demonstrated to their supervisors, who maintain records of each employee’s skills.
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A NUMBER OF TECHNOLOGY INITIATIVES WERE UNDERTAKEN OR IMPLEMENTED DURING THE AUDIT PERIOD

- The Integrated Vehicle Operations Management System (IVOMS), which went into full operation in October 2007, includes automatic vehicle location, vehicle tracking, bus stop annunciation, and transit signal priority.

- The upgrade from SEMA to SAP for the bus maintenance management system, which was completed in November 2008, just after the end of the audit period, provides enhanced user reporting and data management.

- Zonar, an electronic vehicle inspection reporting system, is currently being implemented. Using portable transponders and Radio Frequency Identification (RFID) tags on the vehicles, it is currently being used for pre-trip inspections and work activities on both bus and rail vehicles. In the future, it could also be used for post-trip inspections.

- METRORail established an effective intranet for its maintenance and training staff, which makes all plans, procedures, drawings, schematics, and other relevant documents available at computer kiosks throughout the ROC and gives vehicle technicians full access to M4 and the intranet. Ethernet ports at remote facilities provide similar access for field technicians.

- A new GPS/AVL system is being tested on the light rail vehicles. This system could potentially replace the existing Train to Wayside Communications (TWC), which requires both on-board and wayside equipment, while providing increased functionality and requiring less maintenance.
DURING THE AUDIT PERIOD, METRO ALSO EXPERIENCED SOME CHALLENGES FOR MAINTENANCE

- METRO’s preventive maintenance program ensures that buses cost-effectively achieve their planned useful lives. METRO has significantly improved on-time performance of preventive maintenance inspections (PMIs) since the last maintenance performance audit, with 87% of PMIs performed on-time compared to only 50% previously. However, two of METRO’s five operating facilities accounted for 87% of the late PMIs in FY08 and improved oversight is needed to make certain that inspections are performed on-time at all facilities.

- Hiring and retaining both bus and rail mechanics and cleaners has been an on-going challenge. While METRO has reduced the number of mechanic vacancies to about five, finding good candidates in a good economy (such as that experienced during the audit period) has always been difficult. In an effort to retain cleaners, METRO recently established a career path that provides them a chance to become mechanics.

- Although bus maintenance completed the upgrade from SEMA to SAP in November 2008, there are additional applications that could be interfaced with SAP to increase access to integrated data for improved decision-making, including INIT, Vehicle Location and Scheduling (CAD/AVL), IVOMS, Automatic Passenger Counters (APCs), and Pre-Trip inspections (Zonar). Improving the interfaces and creating a common database could allow METRO to automate the many spreadsheets that are currently used to manage information.

- With a fleet of 18 light rail vehicles, of which 16 are normally in service, METRORail is capacity-constrained to accommodate additional boardings as well as to meet maintenance requirements for the fleet.
Executive Summary…Recommendations

**AUDIT RECOMMENDATIONS ARE THE RESULTS OF FINDINGS IN ALL THREE AREAS OF THE PERFORMANCE AUDIT**

- Performance audit findings are documented in the audit reports applicable to each of the three parts of the performance audit:
  - System maintenance review
  - Performance indicator results
  - Legislative compliance review.

- Each of the three audit reports indicates areas of positive performance as well as opportunities for improved effectiveness, efficiency and productivity. Recommendations offered for METRO’s consideration capitalize on these improvement opportunities.

- Rather than viewing the recommendations as negative, they should be evaluated as opportunities for improvement, and balanced against METRO’s positive performance results and accomplishments during the performance audit review period, as noted throughout the audit reports.

- In total, 14 recommendations are offered as a result of the FY05-FY08 performance audit. For each recommendation, the context, specific implementation steps, and expected results are provided.
Executive Summary…Recommendations

RECOMMENDATIONS ARE INTENDED TO IMPROVE MAINTENANCE PERFORMANCE AND COMPLIANCE WITH LEGISLATIVE AND INDICATOR REPORTING REQUIREMENTS

- Ten recommendations result from the system maintenance review, including four related to maintenance management information systems, two to bus maintenance, and four to rail maintenance. In addition, two recommendations are from the review of State-mandated performance indicators and two are from the assessment of METRO’s compliance with State legislative requirements.

- In November 2008, METRO completed the upgrade of its bus maintenance management system to SAP. Four of the audit recommendations would provide further upgrades to the bus and rail maintenance systems:
  - Recommendation 1: Review opportunities to interface other data sources to SAP to support improved maintenance management and decision-making.
  - Recommendation 2: Update the Maintenance screens in SAP to easily view a vehicle’s previous work order histories
  - Recommendation 3: Develop a plan for a Maximus M4 migration strategy to implement an enterprise rail maintenance system.
  - Recommendation 4: Assist rail and bus divisions in evaluating opportunities to off-load daily mileage automatically through wireless communications.
Executive Summary…Recommendations

RECOMMENDATIONS ARE INTENDED TO IMPROVE MAINTENANCE PERFORMANCE AND COMPLIANCE WITH LEGISLATIVE AND INDICATOR REPORTING REQUIREMENTS (CONTINUED)

• Two recommendations apply to specifically to bus maintenance:
  – Recommendation 5: Improve monitoring of preventive maintenance intervals in order to improve adherence to inspection schedules
  – Recommendation 6: Review METRO’s policy for allocating warranty claim credits to appropriate Responsibility Center accounts.

• Four recommendations are specific to rail maintenance:
  – Recommendation 8: Implement more sophisticated rail maintenance practices and systems that are commonly used by larger rail systems.
  – Recommendation 10: Consider moving one of METRORail’s Siemens servers to the ROC.

• Two recommendations are from the review of the nine state-mandated key performance indicators, as reported in FY05-FY08 Performance Audit – Performance Indicators:
  – Recommendation 11: Complete the review of the methodology for reporting bus on-time performance and, if appropriate, take steps to improve reporting.
  – Recommendation 12: Continue monitoring the motorbus accident rate and taking steps to improve safety.
RECOMMENDATIONS ARE INTENDED TO IMPROVE MAINTENANCE PERFORMANCE AND COMPLIANCE WITH LEGISLATIVE AND INDICATOR REPORTING REQUIREMENTS (CONTINUED)

• Two recommendations are from the assessment of METRO’s compliance with legislative requirements, as reported in FY05-FY08 Performance Audit – Compliance Review:
  – Recommendation 13: Ensure that procedural requirements are met.
  – Recommendation 14: Continue efforts to change the performance audit due date to a specified number of months after the end of the Authority’s fiscal year.
RECOMMENDATION 1: REVIEW OPPORTUNITIES TO INTERFACE OTHER DATA SOURCES TO SAP TO SUPPORT IMPROVED MAINTENANCE MANAGEMENT AND DECISION-MAKING

• **Issues/Opportunity** – With the replacement of the SEMA maintenance management system by SAP, an opportunity exists to improve reporting by integrating the data from several other sources. Currently fluid management, oil analysis, and road call data are integrated into SAP. SAP has the growth potential to provide improved information management for decision support and additional data that could be interfaced with SAP include: farebox data, INIT, Vehicle Location and Scheduling (CAD/AVL), IVOMS, Automatic Passenger Counters (APCs), and Pre-Trip inspections (Zonar).

• **Recommended Action**: METRO should undertake a review of the costs and benefits of implementing SAP interfaces and the potential benefits for information and system management. Overall fleet characteristics, maintenance management, SAP capabilities, parts availability and inventory system accuracy, and maintenance practices including use of work orders, types and numbers of roadcalls, bus cleanliness, and data recording and reporting practices should be maintained as they are areas that represent both achievements and concerns for METRO Maintenance staff. The review should provide sufficient detail to recognize and understand the variability in performance among METRO’s five directly-operated BOFs.

• **Expected Results**: This review will assess the viability and advisability of reducing the effort currently expended preparing reports and transferring information between systems. If the decision is made to proceed with the integration, it will enable more comprehensive assessments of the reasons for METRO’s performance trends and more a conclusive basis for decision-making and strategic planning.
RECOMMENDATION 2: UPDATE THE MAINTENANCE SCREENS IN SAP TO EASILY VIEW A VEHICLE’S PREVIOUS WORK ORDER HISTORIES

• **Issues/Opportunity** – SAP maintenance reporting screens have been migrated from SEMA and user interfaces were maintained during that transition. However, when a user opens a maintenance work order to view a vehicle’s history, another application must be queried to obtain historical work previously performed on the vehicle. The ability to view historical work for a vehicle would improve users’ abilities to recognize vehicle-specific trends and problems.

• **Recommended Action:** METRO should consider adding the ability for an SAP user viewing a work order to view work histories quickly and efficiently from the work order screen.

• **Expected Results:** Improving the ability to spot trends in vehicle repair histories could improve current or pending work actions and reduce costs by making it easier to recognize recurring problems.
RECOMMENDATION 3: DEVELOP A PLAN FOR A MAXIMUS M4 MIGRATION STRATEGY TO IMPLEMENT AN ENTERPRISE RAIL MAINTENANCE SYSTEM

- **Issue/Opportunity:** Maximus M4 is a stand-alone software system that METRORail maintenance uses for work scheduling and work order management. M4 provides an acceptable Maintenance Management System, and METRORail has done an excellent job of expanding its capabilities to cover non-vehicle maintenance. The application meets the current needs of a rail fleet of only 18 vehicles, but the lack of integration of M4 with incident management/reporting, SAP material management, and other reporting systems will become a problem as METRO Solutions Phase 2 is implemented and METRORail grows. An enterprise approach should be taken to improve data integration and to ensure that METRORail’s maintenance information system is incorporated in the IT Disaster Recovery and Business Resumption Plan.

SAP has been upgraded with increased functionality for vehicle maintenance, is integrated with Oracle financials, and provides an infrastructure that will give METRO new options and alternatives. METRO’s IT group has begun to create new tools for maintenance managers and business analysts based on the upgraded SAP databases, which have been favorably received by the users. SAP is currently the material management application for Stores’ support of METRORail, and could be an option for future migration given the enterprise integration prospects.
RECOMMENDATION 3: DEVELOP A PLAN FOR A MAXIMUS M4 MIGRATION STRATEGY TO IMPLEMENT AN ENTERPRISE RAIL MAINTENANCE SYSTEM (CONTINUED)

• **Recommended Action:** Unless the decision is made to develop an enterprise rail maintenance system as part of METRO Solutions Phase 2, METRORail users, METRORail IT staff, and METRO IT should begin a needs analysis and feasibility study for replacing M4. METRORail staff, who have indicated a desire to procure a rail-specific turnkey software package, should seriously consider the capabilities and benefits of the SAP package, which would provide an integrated Authority-wide enterprise solution. The operational concept should retain the existing successful maintenance philosophy. The solution should include an enterprise application that:
  – integrates with METRO’s infrastructure and that will support both planned and future fleet growth
  – integrates with the new Human Resources system
  – integrates with Oracle Financials for procurement and analysis
  – integrates and/or includes Rail Incident Management work flow
  – integrates with SAP’s materials management functions.

• **Expected Results:** Integration with METRO’s existing enterprise MMS will provide future benefits to METRORail as the constraints of the stand-alone M4 program will make it unworkable in an expanded system.
RECOMMENDATION 4: ASSIST RAIL AND BUS DIVISIONS IN EVALUATING OPPORTUNITIES TO OFF-LOAD DAILY MILEAGE AUTOMATICALLY THROUGH WIRELESS COMMUNICATIONS

**Issue/Oppportunity:** The current practice of manually reading and recording mileage from odometers on rail vehicles and hub meters on buses is labor intensive and prone to error. Recognizing the importance of mileage data for statistical purposes and required reporting, considerable effort is expended to manually and reliably capture the data. By implementing wayside communications technology, mileage can be read automatically while the vehicle is being serviced, providing the ability to redirect the time saved to other activities directly related to servicing vehicles and meeting service standards. The wayside communications system also has the potential to support the download of other onboard data based on fault codes generated by electronic control modules to assist in prioritizing and scheduling maintenance work.

**Recommended Action:** METRO should evaluate the cost and benefits of automating the capture of mileage from rail vehicles and buses at the service lane. A requirements and feasibility study should be performed, with the objective of identifying the costs and feasibility of implementing a system that reduces errors and labor to capture and manage mileage as well as on-board fault data, including any on-board equipment and communications infrastructure, and integration with existing systems.

**Expected Results:** Automating mileage readings and downloads of other on-board systems data (e.g., engine fault codes) will reduce the errors incurred with the current system of manually reading and recording mileage, while providing an opportunity to integrate capabilities for automated processing with existing systems, and reduce the time required to manage, validate, and correct mileage data.
RECOMMENDATION 5: IMPROVE MONITORING OF PREVENTIVE MAINTENANCE INTERVALS IN ORDER TO IMPROVE ADHERENCE TO INSPECTION SCHEDULES

- **Issues/Opportunity:** METRO data on PM inspections for FY08 indicate that of the 5,742 PMIs conducted that year, 87% were performed on-time, 1% were conducted early, and 12% were considered late because they exceeded 6,600 miles since the previous inspection. Together, Polk and Kashmere accounted for 87% of the late PMIs. Adherence to preventive maintenance inspection schedules was checked because inspections that are performed early may result in unnecessary costs and inspections that are performed late may result in increased costs associated with deferred maintenance or not catching a defect before it becomes a problem. METRO staff explained that during FY08 there were problems with the Fleetwatch system that is used to track mileage and that aids in scheduling PMIs.

- **Recommended Action:** METRO should take steps to improve monitoring of preventive maintenance intervals on an on-going basis, particularly at Polk and Kashmere, with the objective of improving adherence to PM inspection schedules and conducting more inspections with ±10% of METRO’s 6,000-mile PMI standard. If Fleetwatch is the problem, it may be that there is a need to develop a back-up capability to monitor upcoming PMIs that does not depend entirely on daily access to Fleetwatch and makes it possible to be aware of and schedule buses that are due to be inspected over the next week.

- **Expected Results:** Performing more PM inspections on time (in the 5,400-6,600 mile window) by reducing the number that is performed late will reduce the costs associated with deferred maintenance or not catching a defect before it becomes a problem.
Executive Summary…Recommendations

RECOMMENDATION 6: REVIEW METRO’S POLICY FOR ALLOCATING WARRANTY CLAIM CREDITS TO APPROPRIATE RESPONSIBILITY CENTER ACCOUNTS

• **Issues/Opportunity** – Warranty claims were credited to the appropriate operating facility during the audit period but comments received during the review indicated that the value is currently being credited to Maintenance General (a responsibility center within Bus Maintenance) and not allocated to the appropriate operating facility.

• **Recommended Action**: METRO should consider re-allocating the warranty claims received from each of the RCs and allocate credit to the RC that originated the credit action.

• **Expected Results**: Responsibility Centers would be motivated to fully claim warranted parts if they received the credits.
RECOMMENDATION 7: STANDARDIZE METRORAIL’S PERFORMANCE INDICATORS

**Issues/Opportunity:** Over each of the five years of METRORail operations, the maintenance performance statistics reports have reported different metrics and goals. In part, this is a consequence of an organization that is evolving and only beginning to mature. The FY08 report was far more detailed than earlier years’ reports, but the evolutionary process has made it difficult to make consistent, “apples to apples” comparisons of performance indicators across the years. Equally importantly, some valuable indicators are still not reported, such as warranty recoveries, labor hours, accidents, and vehicle failure rates – and in some cases, data are not available to monitor them (e.g., METRORail maintenance labor hours). This is an appropriate time to set standards for METRORail’s performance reports, and coordinate performance reporting with the rest of the Authority so that similar key performance indicators are available for both bus and rail operations and maintenance. While it is understood that performance reports are likely to reflect annual initiatives and challenges, they should also consistently report indicators of key modal and functional performance.

**Recommended Action:** METRORail should work with METRO’s Quality Assurance/Quality Control staff to define key performance indicators, set goals, and define data gathering and reporting methodologies. Where applicable, these should be consistent with the indicators used for bus operations, although many of the goals will of necessity be different.

**Expected Results:** A coordinated reporting program would provide more consistent results and enable better determination of performance trends and allocations of scarce resources.
RECOMMENDATION 8: IMPLEMENT MORE SOPHISTICATED RAIL MAINTENANCE PRACTICES AND SYSTEMS THAT ARE COMMONLY USED BY LARGER RAIL SYSTEMS

• Issues/Opportunity: Many of METRORail’s maintenance practices suffice for a system of its current size, but would not be sufficient for a larger or more mature system. Both to streamline current maintenance practices and in anticipation of future expansion of Houston’s light rail network, METRORail should consider implementation of certain systems and data tracking/reporting techniques.

• Recommended Action: METRORail should investigate and consider implementation of the following commonly used maintenance practices and systems:
  – Automatic reporting of vehicle equipment failures
  – A system that detects and reports equipment failure trends
  – Expansion of the use of serial numbers for replacement parts, including a method of automating serial number logging by incorporating barcodes and readers
  – Automatic integration of METRORail’s daily report data into the Maintenance Management System.

As the light rail system is extended and additional vehicles are received, METRORail should also restore the LRV test track or construct a new one.

• Expected Results: A transit agency’s maintenance tasks become more complicated as the system matures or grows. Implementation of these more sophisticated systems will enable METRORail maintenance to function more efficiently in the near term, and will provide it with capabilities it will definitely need in the future.
**RECOMMENDATION 9: IMPROVE METRORAIL DOCUMENT CONTROL PROCEDURES**

- **Issues/Opportunity:** METRORail has done an excellent job of developing its intranet and making it available to the entire maintenance department. It currently contains many hundreds of documents, drawings, schematics, procedures, policies, etc., belonging to all four of the maintenance groups and the training function. However, it appears that this implementation has not been matched by appropriate document control practices. METRORail has specific personnel who maintain and upload the files, but the current size of the project requires a more formalized process and record keeping program. At this time, most of the documents only have names, not document numbers, making it easy to accidentally replace or delete the wrong document.

- **Recommended Action:** METRORail should enhance its document control procedures to ensure the timely and accurate uploading of documents on its intranet, filing of hard copy versions, and recording of all such activities. These procedures should be well documented, so that other staff (with appropriate training and permission) can maintain the site. Consideration should also be given to putting some of the documents on FTP web pages, to avoid the need to update an HTTP menu each time a new document is uploaded. Finally, all METRORail documents, including those that are not on the Intranet, should be given a control identifier for easy and unambiguous reference. At a minimum, this identifier would indicate the responsible department and group and provide a location/system ID, sequence number, revision number, and brief description.

- **Expected Results:** Enhancing the document control processes will minimize errors, make it easier to find the proper document, instill confidence that the most recent version of the document is available, and set a standard for future growth of the system.
RECOMMENDATION 10: CONSIDER MOVING ONE OF METRORAIL’S SIEMENS SERVERS TO THE ROC

• **Issues/Opportunity:** METRORail’s signaling, power, and other controls and indications are all routed through two computer servers provided by Siemens. Although backup control centers have become highly favored in the post-9/11 environment, both of the METRORail servers are located at the RCC site, TranStar. One of the servers is on-line, while the other acts as a hot standby, but they do not need to be co-located. Operation of METRORail would be severely curtailed without at least one server available. Although TranStar is considered to be very secure, it could become unusable if either the facility or its fiber-optic connection to METRORail was disabled.

• **Recommended Action:** It is recommended that METRO evaluate the feasibility, costs and benefits of moving one of the Siemens servers to the ROC, taking into consideration the likely impacts of METRO Solutions Phase 2. Relocating one of the servers and keeping the other at TranStar would enhance system availability and allow continued operation should TranStar or its communication network suffer a fault. Moving a server to the ROC would be a simple activity and would still provide an on-line/backup configuration that would support workstations at any location on the fiber-optic ring. No loss of functionality would occur, while system availability would increase.

• **Expected Results:** Loss of either TranStar or the ROC, or communication with either facility, would not cause a loss of functionality of the Siemens servers. Additionally, S&C Maintenance could respond to a system problem more quickly with one server at the ROC.
RECOMMENDATION 11: COMPLETE THE REVIEW OF THE METHODOLOGY FOR REPORTING BUS ON-TIME PERFORMANCE AND IF APPROPRIATE, TAKE STEPS TO IMPROVE REPORTING

• **Issues and Opportunities:** Reported on-time performance for METRO motorbus services fell from 83.6% in FY04 to 59.5% in FY08:
  – The decline in on-time performance is a result of METRO’s transition from manual point checks to electronic data from the IVOMS AVL system.
  – Because the methodology for determining on-time performance changed during the audit period and parallel records were not maintained, it is not possible to determine whether there was a significant change in on-time performance. METRO staff are evaluating the anomalies of IVOMS data and the implications of using it to report on-time performance. As important, however, are METRO’s efforts to address and improve on-time performance, by identifying and analyzing low performing routes, making changes such as schedule adjustments and route adjustments, and using IVOMS capabilities and data to improve service delivery.

• **Recommended Actions:** METRO should complete the evaluation of the methodology for collecting and reporting on-time performance data using IVOMS. This issue has been problematic for three years, first as the data collection methodology changed and more recently, as staff have worked to understand the data and address performance trends indicated by the reporting methodology. Looking forward, it will be important to determine whether the data reported for FY08 (the first full year of reporting using the AVL-based methodology) represents a baseline for the future or whether adjustments are needed to correct data anomalies and the data used to report on-time performance.
RECOMMENDATION 11: COMPLETE THE REVIEW OF THE METHODOLOGY FOR REPORTING BUS ON-TIME PERFORMANCE... (CONTINUED)

• **Expected Results:** Resolving the data issues and making any necessary adjustments to the methodology used in reporting bus on-time performance will permit METRO to identify with confidence the routes and route segments with the most significant schedule adherence issues, and to define strategies that will be effective in addressing on-time performance concerns.
RECOMMENDATION 12: CONTINUE MONITORING THE MOTORBUS ACCIDENT RATE AND TAKING STEPS TO IMPROVE SAFETY

- **Issues and Opportunities:** The motorbus accident rate per 100,000 total miles increased by 17.1% during the audit period, from 3.88 in FY04 to 4.54 in FY08. In FY07, it increased to 4.73 before dropping back to 4.54 in FY08.

- **Recommended Actions:** METRO should continue to watch accident trends closely, on an individual garage and route level basis, in order to identify ways to reduce motorbus accidents and improve safety. This includes conducting extensive training for new operators and refresher training for current operators. This also includes discussing with bus operators techniques to reduce accident risk and the causes of the types of accidents that occur frequently, such as assessing proper speeds and turning movements.

- **Expected Results:** METRO’s motorbus accident rate should improve during the next audit period.
RECOMMENDATION 13: ENSURE THAT PROCEDURAL REQUIREMENTS ARE MET

- METRO is in full compliance with almost all legislative requirements. However, the audit identified seven areas that require closer adherence to procedural requirements:
  - Board Matters #3: Board must be resident citizens and qualified voters of the Authority.
  - Open Meetings #8: Certified Board meeting agendas must be signed by the presiding Board member to indicate they are true and correct representations of the items discussed.
  - Open Meetings #15: Notices of Board meetings must be posted 72 hours prior to the meeting.
  - Open Meetings #18: METRO must respond to information requests within ten days after the request or by an extended due date.
  - Contracts Compliance #3: METRO must post announcements of non-competitive contract awards for two weeks prior to the award.
  - Finance & Administration #12: METRO must distribute annual financial audit reports to required parties in a timely manner.
  - Real Estate #1: Two separate appraisals must be obtained for property purchased by METRO.
RECOMMENDATION 13: ENSURE THAT PROCEDURAL REQUIREMENTS ARE MET (CONTINUED)

• While METRO has met these requirements in most instances, the expectation is that they will be met in all cases.

• It is recommended that METRO establish procedures for implementing these requirements (and possibly for the other legislative requirements that apply to METRO) and clearly communicate the procedures and the expectations that they will be met in every case.
Executive Summary...Recommendations

RECOMMENDATION 14: CONTINUE EFFORTS TO CHANGE THE PERFORMANCE AUDIT DUE DATE TO A SPECIFIED NUMBER OF MONTHS AFTER THE END OF THE AUTHORITY’S FISCAL YEAR

- Texas Transportation Code Section 451.457 requires transit authorities to deliver copies of performance audit reports to the governor and other government officials by February 1 of every second odd-numbered year.

- The audits conducted in FY93, FY97, FY01 and FY04 did not meet the State’s February 1 due date. The last two audits found METRO in non-compliance with respect to the timely completion of the previous performance audit and recommended that METRO consider sponsoring legislation to change the due date for the performance audit report.

- METRO staff report that during the current audit period, the Authority did take steps to try to change the due date of the performance audit report, but efforts to get legislation enacted were not successful.

- Nevertheless, because METRO is non-compliant with the requirement, it is recommended that METRO continue to work to change the performance audit due date to a specified number of months following the end of a transit authority’s fiscal year.
For more information on the previous Audit click here
http://www.ridemetro.org/AboutUs/Publications/AuditPerformance.aspx